SEQUENCE LISTING

<110> Payne, Jewel

Sick, August

<120> Novel Bacillus thuringiensis Isolate Active Against Lepidopteran Pests, and Genes Encoding Novel Lepidopteran-Active Toxins

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<150> US 09/521,344

<151> 2000-03-09

<150> US 08/933,891

<151> 1997-09-19

<150> US 08/356,034

<151> 1994-12-14

<150> US 08/210,110

<151> 1994-03-17

<150> US 07/865,168

<151> 1992-04-09

<150> US 07/451,261

<151> 1989-12-14

<150> US 371,955

<151> 1989-06-27

<160> 8

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<213> Bacillus thuringiensis

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Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser Glu Phe Val
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Pro Gly Ala Gly Phe Val Leu Gly Leu Ile Asp Leu Ile Trp Gly Phe
    50                  55                  60

Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu Gln Leu
65                  70                  75                  80

Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala Ile Ser Arg
                85                  90                  95

Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu Ala Phe Arg
            100                 105                 110

Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Thr Glu Glu Met Arg
        115                 120                 125

Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala Ile Pro Leu
    130                 135                 140

Phe Thr Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val Tyr Val Gln
145                 150                 155                 160

Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser Val Phe Gly
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Gln Arg Trp Gly Phe Asp Val Ala Thr Ile Asn Ser Arg Tyr Asn Asp
            180                 185                 190
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Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val Leu Asp Ile
225                 230                 235                 240

Val Ser Leu Phe Pro Asn Tyr Asp Ser Arg Thr Tyr Pro Ile Arg Thr
                245                 250                 255

Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val Leu Glu Asn
            260                 265                 270

Phe Asp Gly Ser Phe Arg Gly Met Ala Gln Arg Ile Glu Gln Asn Ile
        275                 280                 285

Arg Gln Pro His Leu Met Asp Leu Leu Asn Ser Ile Thr Ile Tyr Thr
    290                 295                 300

Asp Val His Arg Gly Phe Asn Tyr Trp Ser Gly His Gln Ile Thr Ala
305                 310                 315                 320

Ser Pro Val Gly Phe Ala Gly Pro Glu Phe Thr Phe Pro Arg Tyr Gly
                325                 330                 335

Thr Met Gly Asn Ala Ala Pro Pro Val Leu Ile Ser Thr Thr Gly Leu
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Gly Ile Phe Arg Thr Leu Ser Ser Pro Leu Tyr Arg Arg Ile Ile Leu
        355                 360                 365

Gly Ser Gly Pro Asn Asn Gln Asn Leu Phe Val Leu Asp Gly Thr Glu
    370                 375                 380

Phe Ser Phe Ala Ser Leu Thr Ala Asp Leu Pro Ser Thr Ile Tyr Arg
385                 390                 395                 400

Gln Arg Gly Thr Val Asp Ser Leu Asp Val Ile Pro Pro Gln Asp Asn
                405                 410                 415

Ser Val Pro Ala Arg Ala Gly Phe Ser His Arg Leu Ser His Val Thr
            420                 425                 430

Met Leu Ser Gln Ala Ala Gly Ala Val Tyr Thr Leu Arg Ala Pro Thr
        435                 440                 445
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Gly Thr Ser Val Val Lys Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
                485   490   495

Arg Ile Thr Ser Pro Gly Gln Ile Ser Thr Leu Arg Val Thr Ile Thr
            500   505   510

Ala Pro Leu Ser Gln Arg Tyr Arg Val Arg Ile Arg Tyr Ala Ser Thr
        515   520   525

Thr Asn Leu Gln Phe His Thr Ser Ile Asp Gly Arg Pro Ile Asn Gln
    530   535   540

Gly Asn Phe Ser Ala Thr Met Ser Ser Gly Gly Asn Leu Gln Ser Gly
545   550   555   560

Ser Phe Arg Thr Ala Gly Phe Thr Thr Pro Phe Asn Phe Ser Asn Gly
                565   570   575

Ser Ser Ile Phe Thr Leu Ser Ala His Val Phe Asn Ser Gly Asn Glu
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Val Tyr Ile Glu Arg Ile Glu Phe Val Pro Ala Glu Val Thr Phe Glu
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Ala Glu Tyr Asp Leu Glu Arg Ala Gln Glu Ala Val Asn Ala Leu Phe
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Thr Ser Ser Asn Gln Leu Gly Leu Lys Thr Asn Val Thr Asp Tyr His
625   630   635   640

Ile Asp Gln Val Ser Asn Leu Val Glu Cys Leu Ser Gly Glu Phe Cys
                645   650   655

Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys His Ala Asn Arg
            660   665   670

Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile
        675   680   685

Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile
    690   695   700

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Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly
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Thr Phe Asn Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu
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Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg Gly Tyr Ile Glu
            740                 745                 750

Asp Ser Gln His Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Thr Lys His
        755                 760                 765

Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Val
    770                 775                 780

Glu Asn Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro Gln
785                 790                 795                 800

Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys
                805                 810                 815

Cys Ala His His Ser His His Phe Ser Leu Asp Ile Asp Ile Gly Cys
            820                 825                 830

Thr Asp Leu Asn Glu Asn Leu Gly Val Trp Val Ile Phe Lys Ile Lys
        835                 840                 845

Met Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu
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Lys Pro Leu Val Gly Glu Ser Leu Ala Arg Val Lys Arg Ala Glu Lys
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Lys Trp Arg Asp Lys Arg Glu Lys Leu Gln Val Glu Thr Asn Ile Val
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Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln
            900                 905                 910

Tyr Asp Arg Leu Gln Ala Asp Thr Asp Ile Ala Met Ile His Ala Ala
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Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser
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Val Ile Pro Gly Val Asn Ala Gly Ile Phe Glu Glu Leu Glu Gly Arg
945                 950                 955                 960
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Ile Phe Thr Ala Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn
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Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val Lys Gly His Val
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Asp Val Glu Glu Gln Asn Asn His  Arg Ser Val Leu Val  Val Pro Glu
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Trp Glu  Ala Glu Val Ser Gln  Glu Val Arg Val Cys  Pro Gly Arg
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Gly Tyr  Ile Leu Arg Val Thr  Ala Tyr Lys Glu Gly  Tyr Gly Glu
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Gly Cys  Val Thr Ile His Glu  Ile Glu Asp Asn Thr  Asp Glu Leu
    1040                1045                1050

Lys Phe  Ser Asn Cys Val Glu  Glu Glu Val Tyr Pro  Asn Asn Thr
    1055                1060                1065

Val Thr  Cys Asn Asp Tyr Thr  Ala Asn Gln Glu Glu  Tyr Gly Gly
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Ala Tyr  Thr Ser Arg Asn Arg  Gly Tyr Gly Glu Ser  Tyr Glu Ser
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Asn Ser  Ser Ile Pro Ala Glu  Tyr Ala Pro Val Tyr  Glu Glu Ala
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Tyr Ile  Asp Gly Arg Lys Glu  Asn Pro Cys Glu Ser  Asn Arg Gly
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Tyr Gly  Asp Tyr Thr Pro Leu  Pro Ala Gly Tyr Val  Thr Lys Glu
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Leu Glu  Tyr Phe Pro Glu Thr  Asp Lys Val Trp Ile  Glu Ile Gly
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Glu Thr  Glu Gly Thr Phe Ile  Val Asp Ser Val Glu  Leu Leu Leu
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<212> PRT

<213> Bacillus thuringiensis

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Thr Val Ala Asp Ile Ser Leu Gly Leu Ile Asn Phe Leu Tyr Ser Asn
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Gly Phe Ile Gly Pro Ser Gln Trp Asp Ile Phe Leu Ala Gln Ile Glu
65                  70                  75                  80

Gln Leu Ile Ser Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala Ile
                85                  90                  95

Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Lys Val Tyr Val Arg Ala
            100                 105                 110

Phe Ser Asp Trp Glu Lys Asp Pro Thr Asn Pro Ala Leu Arg Glu Glu
        115                 120                 125

Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Ile Thr Ala Ile
    130                 135                 140

Pro Leu Phe Arg Val Gln Asn Tyr Glu Val Ala Leu Leu Ser Val Tyr
145                 150                 155                 160

Val Gln Ala Ala Asn Leu His Leu Ser Ile Leu Arg Asp Val Ser Val
                165                 170                 175

Phe Gly Glu Arg Trp Gly Tyr Asp Thr Ala Thr Ile Asn Asn Arg Tyr
            180                 185                 190

Ser Asp Leu Thr Ser Leu Ile His Val Tyr Thr Asn His Cys Val Asp
        195                 200                 205

Thr Tyr Asn Gln Gly Leu Arg Arg Leu Glu Gly Arg Phe Leu Ser Asp
    210                 215                 220

Trp Ile Val Tyr Asn Arg Phe Arg Arg Gln Leu Thr Ile Ser Val Leu
225                 230                 235                 240

Asp Ile Val Ala Phe Phe Pro Asn Tyr Asp Ile Arg Thr Tyr Pro Ile
                245                 250                 255

Gln Thr Ala Thr Gln Leu Thr Arg Glu Val Tyr Leu Asp Leu Pro Phe
            260                 265                 270

Ile Asn Glu Asn Leu Ser Pro Ala Ala Ser Tyr Pro Thr Phe Ser Ala
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Ala Glu Ser Ala Ile Ile Arg Ser Pro His Leu Val Asp Phe Leu Asn
    290                 295                 300
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Gly His Leu Val Asn Ser Phe Arg Thr Gly Thr Thr Thr Asn Leu Ile
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Arg Ser Pro Leu Tyr Gly Arg Glu Gly Asn Thr Glu Arg Pro Val Thr
            340                 345                 350

Ile Thr Ala Ser Pro Ser Val Pro Ile Phe Arg Thr Leu Ser Tyr Ile
        355                 360                 365

Thr Gly Leu Asp Asn Ser Asn Pro Val Ala Gly Ile Glu Gly Val Glu
    370                 375                 380

Phe Gln Asn Thr Ile Ser Arg Ser Ile Tyr Arg Lys Ser Gly Pro Ile
385                 390                 395                 400

Asp Ser Phe Ser Glu Leu Pro Pro Gln Asp Ala Ser Val Ser Pro Ala
                405                 410                 415

Ile Gly Tyr Ser His Arg Leu Cys His Ala Thr Phe Leu Glu Arg Ile
            420                 425                 430

Ser Gly Pro Arg Ile Ala Gly Thr Val Phe Ser Trp Thr His Arg Ser
        435                 440                 445

Ala Ser Pro Thr Asn Glu Val Ser Pro Ser Arg Ile Thr Gln Ile Pro
    450                 455                 460

Trp Val Lys Ala His Thr Leu Ala Ser Gly Ala Ser Val Ile Lys Gly
465                 470                 475                 480

Pro Gly Phe Thr Gly Gly Asp Ile Leu Thr Arg Asn Ser Met Gly Glu
                485                 490                 495

Leu Gly Thr Leu Arg Val Thr Phe Thr Gly Arg Leu Pro Gln Ser Tyr
            500                 505                 510

Tyr Ile Arg Phe Arg Tyr Ala Ser Val Ala Asn Arg Ser Gly Thr Phe
        515                 520                 525

Arg Tyr Ser Gln Pro Pro Ser Tyr Gly Ile Ser Phe Pro Lys Thr Met
    530                 535                 540

Asp Ala Gly Glu Pro Leu Thr Ser Arg Ser Phe Ala His Thr Thr Leu
545                 550                 555                 560
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Ile Gln Ser Gly Val Tyr Ile Asp Arg Ile Glu Phe Ile Pro Val Thr
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Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Val Val
595 600 605

Asn Ala Leu Phe Thr Ser Thr Asn Gln Leu Gly Leu Lys Thr Asp Val
610 615 620

Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Ala Cys Leu Ser
625 630 635 640

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys
645 650 655

His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn
660 665 670

Phe Arg Gly Ile Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr
675 680 685

Asp Ile Thr Ile Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val
690 695 700

Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln
705 710 715 720

Lys Ile Asp Glu Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg
725 730 735

Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr
740 745 750

Asn Ala Lys His Glu Ile Val Asn Val Pro Gly Thr Gly Ser Leu Trp
755 760 765

Pro Leu Ser Val Glu Asn Gln Ile Gly Pro Cys Gly Glu Pro Asn Arg
770 775 780

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu His Cys Ser Cys Arg
785 790 795 800

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile
805 810 815

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile
820 825 830

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu
835 840 845

Phe Leu Glu Glu Lys Pro Leu Leu Gly Glu Ala Leu Ala Arg Val Lys
850 855 860

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Thr Leu Gln Leu Glu
865 870 875 880

Thr Thr Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe
885 890 895

Val Asn Ser Gln Tyr Asp Arg Leu Gln Ala Asp Thr Asn Ile Ala Met
900 905 910

Ile His Ala Ala Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu
915 920 925

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu
930 935 940

Leu Glu Glu Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn
945 950 955 960

Ile Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Leu Cys Trp Asn Val
965 970 975

Lys Gly His Val Glu Val Glu Glu Gln Asn Asn His Arg Ser Val Leu
980 985 990

Val Ile Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val Cys
995 1000 1005

Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu Gly
1010 1015 1020

Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn Thr
1025 1030 1035

Asp Glu Leu Lys Phe Asn Asn Cys Val Glu Glu Glu Val Tyr Pro
1040 1045 1050

Asn Asn Thr Val Thr Cys Ile Asn Tyr Thr Ala Thr Gln Glu Glu
1055 1060 1065

Tyr Glu Gly Thr Tyr Thr Ser Arg Asn Arg Gly Tyr Asp Glu Ala
1070 1075 1080

Tyr Gly Asn Asn Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr
1085 1090 1095

Glu Glu Lys Ser Tyr Thr Asp Arg Arg Arg Glu Asn Pro Cys Glu
1100 1105 1110

Ser Asn Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr
1115 1120 1125

Val Thr Lys Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp
1130 1135 1140

Ile Glu Ile Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val
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Glu Leu Leu Leu Met Glu Glu
1160 1165

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<212> DNA

<213> Bacillus thuringiensis

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gattttgtat ggggaatagt tggcccttct caatgggatg catttctagt acaaattgaa 240

caattaatta atgaaagaat agctgaattt gctaggaatg ctgctattgc taatttagaa 300

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gctcaagcgg ccaatctgca tctagctata ttaagagatt ctgtaatttt tggagaaaga 540

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acgtatcaag attggataac atataatcga ttacggagag acttaacatt gactgtatta 720

gatatcgccg ctttctttcc aaactatgac aataggagat atccaattca gccagttggt 780

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tttgatatat tgaataatct tacaatcttt acggattggt ttagtgttgg acgcaatttt 960

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<211> 1189

<212> PRT

<213> Bacillus thuringiensis

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Ser Ser Ile Asp Ile Ser Leu Ser Leu Val Gln Phe Leu Val Ser Asn
35 40 45

Phe Val Pro Gly Gly Gly Phe Leu Val Gly Leu Ile Asp Phe Val Trp
50 55 60

Gly Ile Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu
65 70 75 80

Gln Leu Ile Asn Glu Arg Ile Ala Glu Phe Ala Arg Asn Ala Ala Ile
85 90 95

Ala Asn Leu Glu Gly Leu Gly Asn Asn Phe Asn Ile Tyr Val Glu Ala
100 105 110

Phe Lys Glu Trp Glu Glu Asp Pro Asn Asn Pro Ala Thr Arg Thr Arg
115 120 125

Val Ile Asp Arg Phe Arg Ile Leu Asp Gly Leu Leu Glu Arg Asp Ile
130 135 140

Pro Ser Phe Arg Ile Ser Gly Phe Glu Val Pro Leu Leu Ser Val Tyr
145 150 155 160

Ala Gln Ala Ala Asn Leu His Leu Ala Ile Leu Arg Asp Ser Val Ile
165 170 175

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Phe Gly Glu Arg Trp Gly Leu Thr Thr Ile Asn Val Asn Glu Asn Tyr
            180                 185                 190

Asn Arg Leu Ile Arg His Ile Asp Glu Tyr Ala Asp His Cys Ala Asn
        195                 200                 205

Thr Tyr Asn Arg Gly Leu Asn Asn Leu Pro Lys Ser Thr Tyr Gln Asp
    210                 215                 220

Trp Ile Thr Tyr Asn Arg Leu Arg Arg Asp Leu Thr Leu Thr Val Leu
225                 230                 235                 240

Asp Ile Ala Ala Phe Phe Pro Asn Tyr Asp Asn Arg Arg Tyr Pro Ile
                245                 250                 255

Gln Pro Val Gly Gln Leu Thr Arg Glu Val Tyr Thr Asp Pro Leu Ile
            260                 265                 270

Asn Phe Asn Pro Gln Leu Gln Ser Val Ala Gln Leu Pro Thr Phe Asn
        275                 280                 285

Val Met Glu Ser Ser Ala Ile Arg Asn Pro His Leu Phe Asp Ile Leu
    290                 295                 300

Asn Asn Leu Thr Ile Phe Thr Asp Trp Phe Ser Val Gly Arg Asn Phe
305                 310                 315                 320

Tyr Trp Gly Gly His Arg Val Ile Ser Ser Leu Ile Gly Gly Gly Asn
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Ile Thr Ser Pro Ile Tyr Gly Arg Glu Ala Asn Gln Glu Pro Pro Arg
            340                 345                 350

Ser Phe Thr Phe Asn Gly Pro Val Phe Arg Thr Leu Ser Asn Pro Thr
        355                 360                 365

Leu Arg Leu Leu Gln Gln Pro Trp Pro Ala Pro Pro Phe Asn Leu Arg
    370                 375                 380

Gly Val Glu Gly Val Glu Phe Ser Thr Pro Thr Asn Ser Phe Thr Tyr
385                 390                 395                 400

Arg Gly Arg Gly Gln Val Asp Ser Leu Thr Glu Leu Pro Pro Glu Asp
                405                 410                 415

Asn Ser Val Pro Pro Arg Glu Gly Tyr Ser His Arg Leu Cys His Ala
            420                 425                 430
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Thr Phe Val Gln Arg Ser Gly Thr Pro Phe Leu Thr Thr Gly Val Val
435 440 445

Phe Ser Trp Thr His Arg Ser Ala Thr Leu Thr Asn Thr Ile Asp Pro
450 455 460

Glu Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe Arg Val Trp Gly
465 470 475 480

Gly Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
485 490 495

Arg Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln Val Asn Ile Asn
500 505 510

Ser Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg Tyr Ala Ser Ser
515 520 525

Arg Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala Ser Thr Gly Val
530 535 540

Gly Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys Thr Met Glu Ile
545 550 555 560

Gly Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr Asp Phe Ser Asn
565 570 575

Pro Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly Ile Ser Glu Gln
580 585 590

Pro Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu Leu Tyr Ile Asp
595 600 605

Lys Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu Ala Glu Ser Asp
610 615 620

Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ser Asn
625 630 635 640

Gln Ile Gly Leu Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln Val
645 650 655

Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys
660 665 670

Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu
675 680 685

Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro
690 695 700

Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp
705 710 715 720

Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Val Asp Glu
725 730 735

Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys
740 745 750

Ala Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp
755 760 765

Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn
770 775 780

Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala Gln Ser Pro Ile
785 790 795 800

Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn
805 810 815

Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His
820 825 830

Ser His His Phe Thr Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn
835 840 845

Glu Asp Leu Gly Leu Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Asn
850 855 860

His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu
865 870 875 880

Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp
885 890 895

Lys Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val Tyr Lys Glu Ala
900 905 910

Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Arg Leu
915 920 925

Gln Val Asn Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val
930 935 940

His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly
945 950 955 960

Val Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg Ile Phe Thr Ala
965 970 975

Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe Asn
980 985 990

Asn Gly Leu Leu Cys Trp Asn Val Lys Gly His Val Asp Val Glu Glu
995 1000 1005

Gln Asn Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala
1010 1015 1020

Glu Val Ser Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile
1025 1030 1035

Leu Arg Val Thr Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val
1040 1045 1050

Thr Ile His Glu Ile Glu Asp Asn Thr Asp Glu Leu Lys Phe Ser
1055 1060 1065

Asn Cys Val Glu Glu Glu Val Tyr Pro Asn Asn Thr Val Thr Cys
1070 1075 1080

Asn Asn Tyr Thr Gly Thr Gln Glu Glu Tyr Glu Gly Thr Tyr Thr
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Ser Arg Asn Gln Gly Tyr Asp Glu Ala Tyr Gly Asn Asn Pro Ser
1100 1105 1110

Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys Ser Tyr Thr
1115 1120 1125

Asp Gly Arg Arg Glu Asn Pro Cys Glu Ser Asn Arg Gly Tyr Gly
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Asp Tyr Thr Pro Leu Pro Ala Gly Tyr Val Thr Lys Asp Leu Glu
1145 1150 1155

Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile Gly Glu Thr
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Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu Leu Met Glu
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<211> 3522

<212> DNA

<213> Bacillus thuringiensis

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acacgtttcc ttttgagtga atttgttcca ggtgtgggag ttgcgtttgg attatttgat 180

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<211> 1174

<212> PRT

<213> Bacillus thuringiensis

<400> 8

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Pro Leu Asp Ile Ser Leu Ser Leu Thr Arg Phe Leu Leu Ser Glu Phe
        35                  40                  45

Val Pro Gly Val Gly Val Ala Phe Gly Leu Phe Asp Leu Ile Trp Gly
    50                  55                  60

Phe Ile Thr Pro Ser Asp Trp Ser Leu Phe Leu Leu Gln Ile Glu Gln
65                  70                  75                  80

Leu Ile Glu Gln Arg Ile Glu Thr Leu Glu Arg Asn Arg Ala Ile Thr
                85                  90                  95

Thr Leu Arg Gly Leu Ala Asp Ser Tyr Glu Ile Tyr Ile Glu Ala Leu
            100                 105                 110

Arg Glu Trp Glu Ala Asn Pro Asn Asn Ala Gln Leu Arg Glu Asp Val
        115                 120                 125

Arg Ile Arg Phe Ala Asn Thr Asp Asp Ala Leu Ile Thr Ala Ile Asn
    130                 135                 140

Asn Phe Thr Leu Thr Ser Phe Glu Ile Pro Leu Leu Ser Val Tyr Val
145                 150                 155                 160

Gln Ala Ala Asn Leu His Leu Ser Leu Leu Arg Asp Ala Val Ser Phe
                165                 170                 175

Gly Gln Gly Trp Gly Leu Asp Ile Ala Thr Val Asn Asn His Tyr Asn
            180                 185                 190

Arg Leu Ile Asn Leu Ile His Arg Tyr Thr Lys His Cys Leu Asp Thr
        195                 200                 205

Tyr Asn Gln Gly Leu Glu Asn Leu Arg Gly Thr Asn Thr Arg Gln Trp
    210                 215                 220

Ala Arg Phe Asn Gln Phe Arg Arg Asp Leu Thr Leu Thr Val Leu Asp
225                 230                 235                 240

Ile Val Ala Leu Phe Pro Asn Tyr Asp Val Arg Thr Tyr Pro Ile Gln
                245                 250                 255

Thr Ser Ser Gln Leu Thr Arg Glu Ile Tyr Thr Ser Ser Val Ile Glu
            260                 265                 270
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Asp Ser Pro Val Ser Ala Asn Ile Pro Asn Gly Phe Asn Arg Ala Glu
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Phe Gly Val Arg Pro Pro His Leu Met Asp Phe Met Asn Ser Leu Phe
    290                 295                 300

Val Thr Ala Glu Thr Val Arg Ser Gln Thr Val Trp Gly Gly His Leu
305                 310                 315                 320

Val Ser Ser Arg Asn Thr Ala Gly Asn Arg Ile Asn Phe Pro Ser Tyr
                325                 330                 335

Gly Val Phe Asn Pro Gly Gly Ala Ile Trp Ile Ala Asp Glu Asp Pro
            340                 345                 350

Arg Pro Phe Tyr Arg Thr Leu Ser Asp Pro Val Phe Val Arg Gly Gly
        355                 360                 365

Phe Gly Asn Pro His Tyr Val Leu Gly Leu Arg Gly Val Ala Phe Gln
    370                 375                 380

Gln Thr Gly Thr Asn His Thr Arg Thr Phe Arg Asn Ser Gly Thr Ile
385                 390                 395                 400

Asp Ser Leu Asp Glu Ile Pro Pro Gln Asp Asn Ser Gly Ala Pro Trp
                405                 410                 415

Asn Asp Tyr Ser His Val Leu Asn His Val Thr Phe Val Arg Trp Pro
            420                 425                 430

Gly Glu Ile Ser Gly Ser Asp Ser Trp Arg Ala Pro Met Phe Ser Trp
        435                 440                 445

Thr His Arg Ser Ala Thr Pro Thr Asn Thr Ile Asp Pro Glu Arg Ile
    450                 455                 460

Thr Gln Ile Pro Leu Val Lys Ala His Thr Leu Gln Ser Gly Thr Thr
465                 470                 475                 480

Val Val Arg Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu Arg Arg Thr
                485                 490                 495

Ser Gly Gly Pro Phe Ala Tyr Thr Ile Val Asn Ile Asn Gly Gln Leu
            500                 505                 510

Pro Gln Arg Tyr Arg Ala Arg Ile Arg Tyr Ala Ser Thr Thr Asn Leu
        515                 520                 525
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Arg Ile Tyr Val Thr Val Ala Gly Glu Arg Ile Phe Ala Gly Gln Phe
530 535 540

Asn Lys Thr Met Asp Thr Gly Asp Pro Leu Thr Phe Gln Ser Phe Ser
545 550 555 560

Tyr Ala Thr Ile Asn Thr Ala Phe Thr Phe Pro Met Ser Gln Ser Ser
565 570 575

Phe Thr Val Gly Ala Asp Thr Phe Ser Ser Gly Asn Glu Val Tyr Ile
580 585 590

Asp Arg Phe Glu Leu Ile Pro Val Thr Ala Thr Phe Glu Ala Glu Tyr
595 600 605

Asp Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ile
610 615 620

Asn Gln Ile Gly Ile Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln
625 630 635 640

Val Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu
645 650 655

Lys Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp
660 665 670

Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Lys Gly Ile Asn Arg Gln
675 680 685

Leu Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Arg Gly
690 695 700

Asp Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Phe Asp
705 710 715 720

Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu
725 730 735

Lys Pro Tyr Thr Arg Tyr Gln Leu Arg Gly Tyr Ile Glu Asp Ser Gln
740 745 750

Asp Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Thr Val
755 760 765

Asn Val Leu Gly Thr Gly Ser Leu Trp Pro Leu Ser Val Gln Ser Pro
770 775 780

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Ile Arg Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp
785                 790                 795                 800

Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His
                805                 810                 815

His Ser His His Phe Ser Leu Asp Ile Asp Val Gly Cys Thr Asp Leu
            820                 825                 830

Asn Glu Asp Leu Asp Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp
        835                 840                 845

Gly His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu
    850                 855                 860

Val Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg
865                 870                 875                 880

Asp Lys Arg Glu Lys Leu Glu Leu Glu Thr Asn Ile Val Tyr Lys Glu
                885                 890                 895

Ala Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Gln
            900                 905                 910

Leu Gln Ala Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg
        915                 920                 925

Val His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro
    930                 935                 940

Gly Val Asn Val Asp Ile Phe Glu Glu Leu Lys Gly Arg Ile Phe Thr
945                 950                 955                 960

Ala Phe Phe Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe
                965                 970                 975

Asn Asn Gly Leu Ser Cys Trp Asn Val Lys Gly His Val Asp Val Glu
            980                 985                 990

Glu Gln Asn Asn His Arg Ser Val  Leu Val Val Pro Glu  Trp Glu Ala
        995                 1000                1005

Glu Val  Ser Gln Glu Val Arg  Val Cys Pro Gly Arg  Gly Tyr Ile
    1010                1015                1020

Leu Arg  Val Thr Ala Tyr Lys  Glu Gly Tyr Gly Glu  Gly Cys Val
    1025                1030                1035
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Thr Ile  His Glu Ile Glu Asn  Asn Thr Asp Glu Leu  Lys Phe Ser
    1040                1045                1050

Asn Cys  Val Glu Glu Glu Val  Tyr Pro Asn Asn Thr  Val Thr Cys
    1055                1060                1065

Asn Asp  Tyr Thr Ala Asn Gln  Glu Glu Tyr Gly Gly  Ala Tyr Thr
    1070                1075                1080

Ser Arg  Asn Arg Gly Tyr Asp  Glu Thr Tyr Gly Ser  Asn Ser Ser
    1085                1090                1095

Val Pro  Ala Asp Tyr Ala Ser  Val Tyr Glu Glu Lys  Ser Tyr Thr
    1100                1105                1110

Asp Gly  Arg Arg Asp Asn Pro  Cys Glu Ser Asn Arg  Gly Tyr Gly
    1115                1120                1125

Asp Tyr  Thr Pro Leu Pro Ala  Gly Tyr Val Thr Lys  Glu Leu Glu
    1130                1135                1140

Tyr Phe  Pro Glu Thr Asp Lys  Val Trp Ile Glu Ile  Gly Glu Thr
    1145                1150                1155

Glu Gly  Thr Phe Ile Val Asp  Ser Val Glu Leu Leu  Leu Met Glu
    1160                1165                1170

Glu
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